PALEONTOLOGICAL RESOURCES IN SOUTHEASTERN OKLAHOMA:

A SURVEY OF THE LITERATURE

by

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and

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PALEONTOLOGICAL RESOURCES IN SOUTHEASTERN OKLAHOMA

INTRODUCTION

This report comprises results of a literature search for significant references to important paleontological discoveries and localities in several southeastern Oklahoma counties that contain Federal Coal Reserves. Greatest emphasis has been placed on areas containing these reserves, which may be subject to future mining operations. Adjacent areas have also been reviewed, but little effort has been made to document specific localities beyond about thirty miles from the coal boundaries. No claim is made that the accompanying list of localities and references is exhaustive, but it is believed that the greater part of the relevant literature, both published and unpublished, has been scanned. The following basic sources were consulted: U.S.G.S. Bibliography of North American Geology; Geological Society of America Bibliography and Index of Geology; Oklahoma Geological Notes; Comprehensive Dissertation Index, Volume 16, Geography and Geology, Xerox University Microfilms, Ann Arbor, Michigan. Between 80 and 90 percent of all references located have been checked. The other 10 to 20 percent were judged relatively unimportant, based on titles. Extensive use was made of library resources at The University of Texas at Austin and the University of Oklahoma at Norman.

Localities which have yielded important fossil collections or have produced voucher specimens have been assigned sequential numbers and have been placed on the accompanying maps. In some instances, however, the available locality information has proved too vague for accurate map identification and such localities are not shown on the maps.

The original copy of the report is accompanied by a series of U.S. Geological Survey quadrangle maps; copies have smaller scale maps which, however, identify all localities shown on the quadrangle sheets.

The senior author of this report is a vertebrate paleontologist and the junior author is a Ph.D. candidate at The University of Texas at Austin, working on the paleoecology of the Oil Creek Formation (Middle Ordovician) in the Arbuckle Mountains which adjoins the study area to the west. While neither author has had firsthand experience with the paleontology of the study area, every attempt has been made to contact paleobotanists, palynologists, invertebrate paleontologists and paleoentomologists with current interest in the area. At least one individual having recognized expertise in each of these disciplines is identified under "Recommendations."

DEFINITION OF STUDY AREA

The study area (Fig. 1) is bounded on the north by the Canadian and Arkansas Rivers and extends south to the Texas-Oklahoma border. It comprises parts or all of the

Localities which have yielded important fossil collections or have produced stratigraphic data have been assigned locality numbers and have been plotted on the accompanying maps. In some instances, however, the locality data locating collections is too vague for any map identification and such localities are not shown on the maps.

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DESCRIPTION OF STUDY AREA

The study area (Figs. 1) is bounded on the north by the Canadian and Arkansas Rivers and extends south to the Texas-Oklahoma border. It encompasses all or part of the

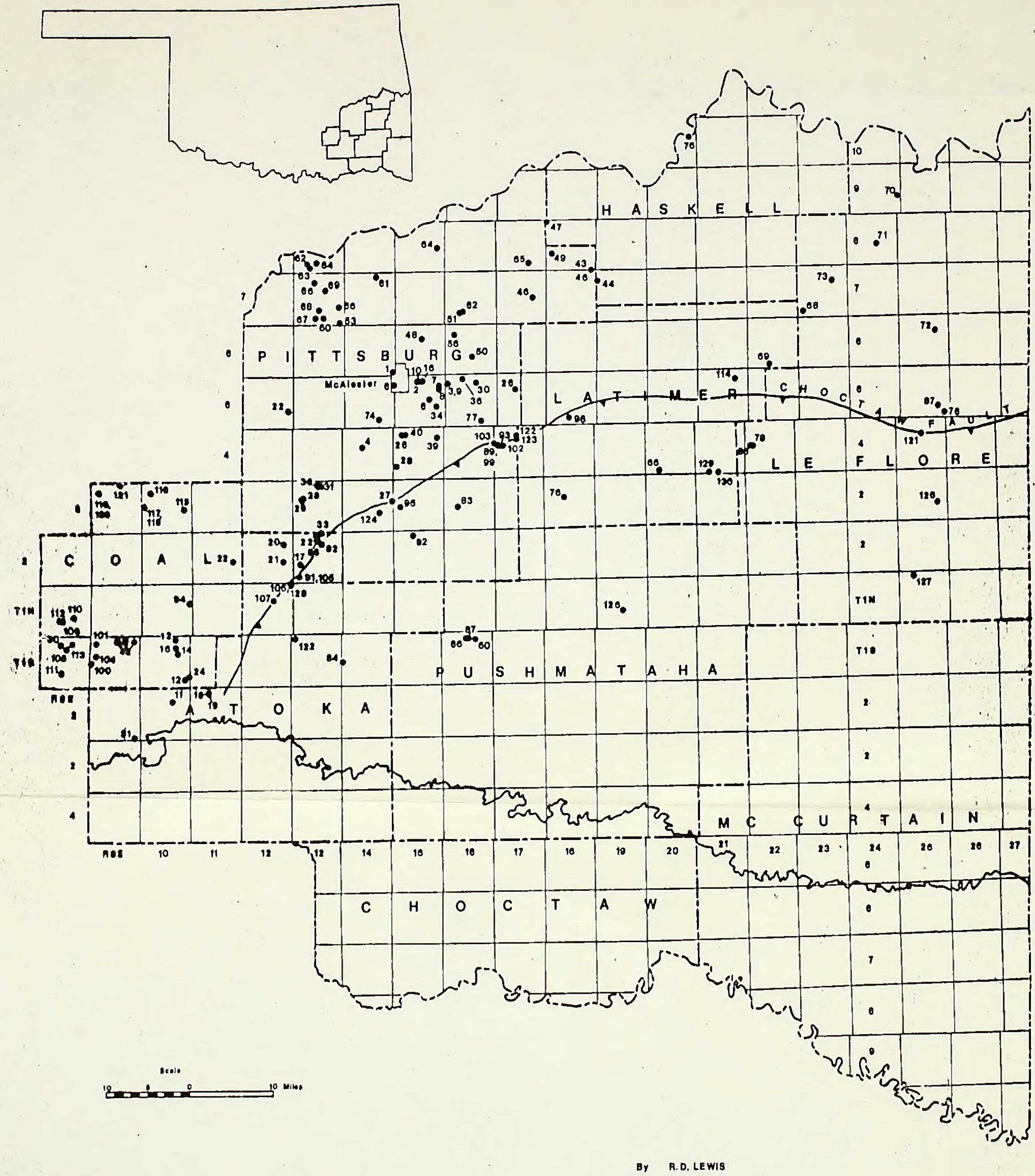

Figure 1: Locality Index Map

following counties: Haskell, Pittsburg, Latimer, Le Flore, Coal, Atoka, Pushmataha, Choctaw, and McCurtain. Of most intense interest are the approximately 372,000 acres of Federal Coal Reserve lands and neighboring areas (Fig. 2).

Portions of three geological provinces are represented in the study area: the Arkoma Basin (formerly called the McAlester Basin), the Ouachita Mountains, and the Coastal Plain. The stratigraphic interval involved is summarized in Figure 3. The rocks found in the Arkoma Basin are Lower to Middle Pennsylvanian in age: Atoka Formation through the Thurman Sandstone. The Ouachita Mountains contain older rocks, mainly of Lower Pennsylvanian and Mississippian age, but also include limited exposures of Ordovician to Devonian strata. The Coastal Plain, by definition, consists of overlapping Cretaceous strata.

Depositional environments range from fluvial-deltaic and estuarine (Arkoma Basin), to shelf-margin and basin (Ouachita Mountains), to shore and strand plain (Coastal Plain).

HISTORY OF RESEARCH

Because of varying interest in the different provinces it is useful to discuss the history of research on a provincial basis. Historically, the Arkoma Basin has received the most paleontological attention; the coastal plain the least.

<u>Arkoma Basin</u>--The discovery of paleontological collecting localities within the area of most intense interest

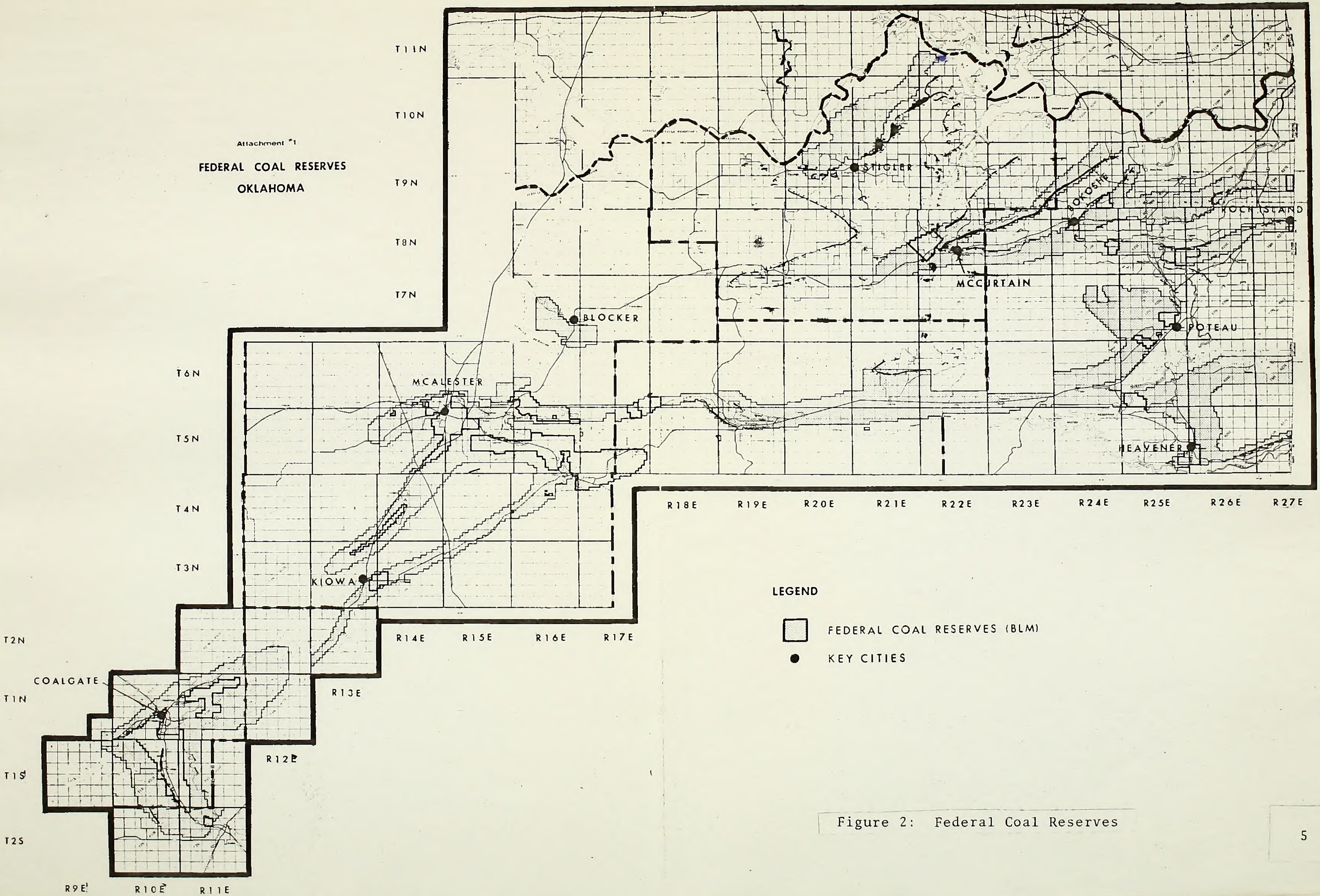

Figure 2: Federal Coal Reserves

SYSTEM	SERIES	GROUP	FORMATION	COAL BED
QUATERNARY			GERTY SANDSTONE	
CRETACEOUS	GULF	EAGLE FORD		
		WOODBINE		
		WASHITA		
	COMANCHE	FREDERICKSBURG		
		TRINITY	PALUXY SANDSTONE	
			DEQUEEN LIMESTONE	
			HOLLY CREEK FORMATION	
PENNSYLVANIAN	DESMOINESIAN		THURMAN SANDSTONE	
		KREBS	BOGGY FORMATION	SECOR LOWER WITTEVILLE
			SAVANNA FORMATION	LOWER BOGGY CAVANAL
			MCALESTER FORMATION	STIGLER MCALESTER (LEHIGH) UPPER HARTSHORNE
			HARTSHORNE SANDSTONE	LOWER HARTSHORNE
	ATOKAN		ATOKA FORMATION	
	MORROWAN		WAPANUCKA LIMESTONE	
			JOHNS VALLEY SHALE	
MISSISSIPPIAN	CHESTERIAN	CANEY SHALE: JACKFORK SANDSTONE		
	MERAMECIAN	CANEY SHALE: STANLEY SHALE		
DEVONIAN		ARKANSAS NOVACULITE		

Figure 3: Stratigraphic Section

has been intimately associated with the exploration and evaluation of coal reserves. Much of the early collecting was done by members of the U.S. Geological Survey during field investigations of coal deposits.

The first detailed account of the coal beds in the Arkoma Basin is by H. M. Chance (1890) who mapped exposures of coal beds and described the coal-bearing rocks between the towns of McAlester and Cavanal, about 50 miles to the east. No specific fossil sites were described in Chance's report, however.

The first significant discussion of fossils in the area is contained in a U.S. Geological Survey report by J. A. Taff (1899), who named and mapped the formations in the McAlester and Lehigh districts, in Pittsburg and Coal Counties. Accompanying papers by David White (1899) and G. H. Girty (1899) described the plant and invertebrate fossils, respectively. Both White and Girty described new species and reposited their material at the U.S. National Museum, but neither author designated type specimens.

The best single reference to paleontological localities associated with coal beds in the Arkoma Basin is found in U.S.G.S. Bulletin 874. This study divided the area into four districts which were mapped and described in detail by the U.S. Geological Survey from 1930 to 1934 (Hendricks, 1937; Knechtel, 1937; Dane et al., 1938; Hendricks, 1939). Separate reports were issued as four parts of the same volume. Although no new species are described, lists of species are given for specific localities and fossiliferous horizons are discussed along with measured sections. Hendricks' (1937) report (Part A) on

the McAlester district discusses fossil-bearing horizons generally and lists 16 localities (see "Localities"). Part B, on the Lehigh district (Knechtel, 1937), lists only 2 specific fossil-collecting localities. The most detailed treatment of fossils is found in Part C on the Quinton-Scipio district, which contains frequent thin and very fossiliferous limestones (Dane et al., 1938). A total of 24 localities are included but many are north of the area of the Federal Coal Reserves. Except for 3 specific localities, only very generalized descriptions are given in Part D, for the eastern part of the basin (Hendricks, 1939).

A few occurrences of fossiliferous horizons in Le Flore County are noted by Knechtel (1949). We include 4 such localities, because of their close proximity to the Federal Coal Reserves, even though the fossils were not listed or described by Knechtel. In addition, Knechtel describes thin beds of fossiliferous limestone above coal beds in the Savanna Formation in: sec. 4, T 9 N, R 26 E; sec. 22, T 7 N, R 23 E; Wildhorse Creek, T 7 N, R 23 E; and secs. 3-12, T 7 N, R 25 E, Le Flore County (Knechtel, 1949, pp. 49-50).

A locality about 4 miles south of McAlester (Locality 74) has provided material for 4 significant studies (Henbest, 1958; Mamay, 1959; Mamay & Yochelson, 1962; Zidek, 1972). Here, in what apparently was a very local occurrence of limestone capping the Secor coal, nodules of marine limestone and concretions known as coal balls were found to contain significant plant, invertebrate, and vertebrate fossils. This is one of the few occurrences known of what

Mamay and Yochelson term "mixed" coal balls, i.e., containing both plant and animal remains.

The coal beds of the Arkoma Basin have also been studied for their microfloral assemblages (Morgan, 1955; Urban, 1962; Dempsey, 1964; Clark, 1968).

Investigations not directly associated with coal exploration have identified a few fossil localities in beds adjacent to the coal-bearing formations of the Basin. The earliest and one of the most significant of such studies is a description of the invertebrate fossils of the Caney Shale by Girty (1909). Girty described 49 species, many of them new, but as in his earlier work (Girty, 1899) no type specimens were designated. Although most of Girty's 31 localities are in the Ouachita Mountains, a few are in the southern portion of the Arkoma Basin.

The Wapanucka Limestone has yielded a variety of Pennsylvanian invertebrate and vertebrate fossils. Harlton (1928, 1929, 1933) described ostracods and conodonts (including fish teeth) from this formation. Zidek (1976) reports isolated fish teeth from the Wapanucka Limestone in Atoka and Pittsburg Counties and reviews earlier finds in the area in a series of articles on the fossil fish of Oklahoma (Zidek, 1972, 1973a, 1973b, 1976). Fossil corals of the Wapanucka were studied by Rowett (1962, 1966) and Rowett and Sutherland (1964).

Strimple (1966, 1975) has described 21 new species of crinoids from the Barnett Hill Member of the Atoka Formation in western Coal County (5 localities).

The area in Pontotoc and western Coal Counties, west of the Federal Coal Reserves, should be noted because of the

many fine invertebrate fossils collected there, primarily in Silurian and Devonian rocks. More fossils have come from here than from the study area itself. Well-known invertebrate fossil-collecting localities in the vicinity of Ada (Pontotoc County) are discussed by Alexander and Alexander (1951). Exposures of the Haragan Formation (Devonian) near the old Hunton townsite, northwest of Clarita, in western Coal County, have attracted many invertebrate paleontologists through the years. Strimple (1963) describes the crinoid fauna and cites references for other groups of invertebrates. Naff (1962) lists the invertebrate faunas from 75 localities in Pontotoc and Coal Counties; his 7 localities in northwest Coal County are included in this report.

There appears to have been little paleontological interest in the Arkoma Basin in the last 15 years except for research (primarily on palynomorphs) by Professor L. R. Wilson of the University of Oklahoma and his students.

Ouachita Mountains--In the early 1900's members of the U.S. Geological Survey (notably J. A. Taff, G. I. Adams, A. H. Purdue, and H. D. Miser) did the first detailed geologic field work in this province. Their emphasis was on mapping the formations and the many faults in the area, and little note was taken of fossil occurrences (see L. D. Fellows, 1963, pp. 5-8 for a review of the history of geologic investigation). It was soon realized that fossils are rare in the prevailing sandstone-and-shale sequences of this area as compared to the strata to the north, i.e., the Arkoma Basin, which include fossiliferous limestones.

As discussed in the preceding section, the faunas of the Caney Shale were described by Girty (1909). Pennsylvanian microfossils (including some fossil fish teeth) from the Johns Valley Shale were studied by Harlton (1933). Plant megafossils from the Stanley Shale and Jackfork Sandstone were examined in a major study by White (1936). Thirteen new species were described and specimens were reposited at the U.S. National Museum. Read's description of a new species of fern from the Johns Valley shale adds one locality in the frontal Ouachita Mountains (Read, 1938).

One of the best-known recent studies in the Ouachita province is the investigation of regional changes in trace fossils by Chamberlain (1970, 1971). A roster of Chamberlain's 187 localities, which we consider too voluminous to include in this report, is available through loan of his dissertation (Chamberlain, 1970) or by purchase of document NAPS 00990 from ASIS National Auxiliary Publications Service, c/o CCM Information Sciences, Inc., 909 Third Avenue, New York, N.Y. 10022, $2.00 for microfiche or $5.00 for photocopies.

Coastal Plain--This province extends into Oklahoma only in the southern tier counties. Its northernmost extent is in central Atoka County. Viewed mainly as a source for Lower Cretaceous vertebrate fossils, the Comanchean sediments of the Coastal Plain have been very little investigated paleontologically. Only one township in southern Atoka County has been recorded as yielding significant material (Stovall and Langston, 1950; Langston, 1974). Invertebrate fossils are discussed (without giving specific localities) along with a treatment of stratigraphy and

geologic history by Miser, 1927. Macrofossils of the Trinity Group from the vicinity of Broken Bow (near center, McCurtain County) are listed in Vanderpool (1928) but the collecting locality is not given.

CURRENT RESEARCH

Professor L. R. Wilson of the University of Oklahoma and his students have recently collected plant fossils, especially palynomorphs, in the study area. Three plant megafossil localities were provided by one of Dr. Wilson's recent students, Bruce Bradshaw, 46215 SE Coalman Road, Sandy, Oregon 97055. Another student and former preparator for Dr. Wilson who has collected fossil plants in the area is Roger J. Burkhalter, 212 E. Coe, Midwest City, Oklahoma 73110. Attempts to contact Mr. Burkhalter have been unsuccessful.

Dr. J. D. Naff, Department of Geology, Oklahoma State University, Stillwater, did his dissertation research in an adjacent area (southwestern Pontotoc and northeastern Coal Counties) and has since taken his classes on field trips in the area of the Federal Coal Reserves.

Dr. C. J. Durden, Texas Memorial Museum, Austin, Texas 78712, a specialist in Pennsylvanian insects, has expressed interest in this project because of a fossil insect collected in the area by J. A. Taff in 1904.

H. L. Strimple, Curator and Research Associate, Department of Geology, University of Iowa, Iowa City, Iowa 52242, has worked with Pennsylvanian crinoids just west of the study area.

Professor Patrick K. Sutherland, School of Geology and Geophysics, University of Oklahoma, is currently investigating exposures of the Wapanucka Limestone in the frontal Ouachita Mountains.

SUMMARY OF FOSSIL OCCURRENCES

Plant Fossils--For a review of the development of paleobotany in Oklahoma, including the study area, see Wilson (1960). Plant remains (especially magafossils) are the most important fossils known from the area of primary interest. Studies dealing specifically with plant fossils are White (1899, 1936), Read (1938), Henbest (1958), Mamay (1959), and Mamay and Yochelson (1962). Plant-rich horizons are also noted in U.S.G.S. Bulletin 874 (Hendricks, 1937; Knechtel, 1937; Dane et al., 1938; and Hendricks, 1939).

The occurrence of fossil plants is controlled primarily by stratigraphic horizon rather than by specific geographic location. Shales overlying coal beds have been particularly productive. Wilson (personal communication, June 1977) states that plant fossils are to be expected in abundance in the roofing shale of the Hartshorne and Secor coal anywhere these strata are exposed. At some localities sand (possibly deposited in crevasse splays) swept across forests growing in what is now the upper part of the Lower Hartshorne coal and preserved hundreds of *Calamites* and *Cordaites* trunks, some of which are still upright (Hendricks, 1939, p. 264, Pl. 29B).

Of particular interest is the occurrence of coal balls south of McAlester (Locality 74). The coal balls and the limestone caprock in which they were found have produced the curious genus of algae Litostroma (Mamay, 1959), in addition to a concentration of other plant and animal remains (Mamay and Yochelson, 1962). The original material was collected by C. B. Read in 1939 from limestone capping the Secor coal. Mamay and Yochelson (1962, p. 105) examined other exposures of the Secor coal in this area but failed to locate the caprock.

Palynological samples are not treated in detail in this report because they are neither so perishable nor so restricted in occurrence as are plant megafossils. A general trend, reviewed and discussed by Wilson (1961) is that spores and pollen are more prevalent and better preserved in the western part of the Arkoma Basin because of low-grade metamorphism of rocks in the eastern portion. For summaries of palynomorph occurrences see Wilson (1961), Morgan (1955), Urban (1962), Dempsey (1964), and Clark, (1968).

Invertebrate Fossils--Little significant research has been done on this group of fossils in the Arkoma Basin itself since Girty's work in 1899. The reports by Hendricks (1937), Knechtel (1937), Dane et al. (1938), and Hendricks (1939) show that invertebrates are not uncommon in this province, but no invertebrates were illustrated or described in detail by them.

Their faunal lists suggest that brachiopods and molluscs are the most prevalent invertebrates in the area. No one has published detailed studies of these groups within the Arkoma Basin, however.

A few studies of microfossils are noteworthy. Henbest (1958) described various species and genera of cornuspirid foraminifera found in limestone nodules at the coal ball locality (74) south of McAlester. Henbest's paper is the first to demonstrate that some of these sessile forms attached to (perishable) marine algae, hence explaining the occurrence of individuals which appear to be unattached. Harris and Holingsworth (1933) describe conodonts from the Boggy Formation. Ostracods and conodonts from the Wapanucka Limestone were studied by Harlton (1928, 1929, 1933). Microfossils from the Wesley, Johns Valley, and Atoka Formations of the Ouachita Mountains are examined in a dissertation by Johansson (1960). Rigby et al. (1970) describes fossil sponges from the Wapanucka Limestone, Atoka, Johns Valley, and Wesley Formations of the Ouachita Mountains. Sponges from the Wapanucka Limestone are also noted in Sutherland and Grayson (1977).

A few corals are reported from the Arkoma Basin, but the only significant studies have been in the Wapanucka Formation (Rowett, 1962, 1966; Rowett and Sutherland, 1964).

Echinoderms occurring in the study area have been largely ignored by non-specialists. The fauna described from the Atoka Formation west of the study area (Strimple, 1966, 1975) suggests that similar collections could be made in associated strata. The listings of _Hydreionocrinus acanthophorus_ and _H. mucrospinus_ from the Savanna Sandstone

by Dane et al. (1938) probably refers to the distinctive spinose plates of the crinoid family Pirasocrinidae. Field investigations by an echinoderm specialist might result in more complete specimens.

One specimen of the insect Metachorus striolatus Handlirsch, 1906 (U.S.N.M. No. 35386) is known from the Arkoma Basin. It was collected by J. A. Taff in 1904. Unfortunately, the only locality information given on the label is "Indian Territory," but it probably came from the roof of the McAlester coal (C. J. Durden, personal communication, June 1977). This suggests that more insects might be found in roofing shales of coal beds, should mining be resumed.

Vertebrate Fossils--Few fossil vertebrates have been recovered from the study area or closely adjacent lands. Not many of the localities have been precisely recorded in the literature. Virtually all occurrences are isolated fragments of fortuitous discovery; there are no known concentrations or bone beds in the area.

Only Paleozoic fish remains are known from the study area. Mississippian and older fish material comprise isolated arthrodire plates of uncertain origin (Eastman, 1917; Zidek, 1972, 1973b), an elasmobranch spine (Eastman, 1917; Zidek, 1972, 1973a), and the holotype specimen of the primitive shark Cladodus aculeatus Eastman (1917). These specimens are discussed definitively in the works cited.

Pennsylvanian vertebrates are best known from areas adjacent to the study area particularly in Pontotoc and Jefferson counties. These occurrences are summarized by Zidek (1972, 1973a, 1976). Like the few localities within

the study area they have produced mostly isolated finds with the only multiple discoveries coming from the Coffeyville Formation of Missourian age in the Superior Clay Products pit near Ada, Pontotoc County. These sites are outside the area of the immediate concern of this report. Within the study area denticles, teeth and spines of Pennsylvanian sharks have been found in Atoka, Pittsburg and Coal Counties and there are a few bony fish teeth from Coal County. These are summarized by Zidek in the references cited above.

Several "species" of Multidentodus and Holmesella which were described as conodonts by Harlton (1933) were recognized as fish remains at the time. They are shark (cladoselachian) dermal and mucous membrane denticles (Zidek, 1973a). The "conodonts" Ichyodus gunneli Harris and Holingsworth (1933) are, similarly, bony fish teeth.

One locality of note within the study area is an abandoned slope mine four miles south of McAlester, reported by Mamay and Yochelson (1962). This is the source of a number of coal balls which contain, atypically, a variety of fish remains and invertebrate fossils in addition to the customary plant residues. Of all the fossil vertebrate localities in the study area this one probably deserves further investigation because the origin of these "mixed" coal balls has not been satisfactorily explained (Zidek, 1972).

The only other fossil vertebrates reported from southeastern Oklahoma are from Lower Cretaceous (Comanchean) rocks in Atoka and the southern tier counties. For a summary, see Langston (1974). The closest sites to the study

area are in southeastern Atoka County, T 4 S, R 14 E, and hence well away from areas of potential disruption related to the Federal Coal Reserves.

GENERAL EVALUATION

Few important fossil-collecting localities exist within the area of most intense interest. Fossil discoveries in the past have largely fortuitous by-products of prospecting or mining. Many localities reported in early investigations are probably destroyed or covered and are no longer available. However, certain stratigraphic horizons and lithosomes that are known to contain fossils should be monitored during any future mining operations.

NOMINATION OF NATURAL LANDMARKS

We have not identified any areas suitable for Natural Landmarks because of outstanding fossil occurrences. It is possible, however, that mining may expose an area of unusually well-preserved fossils, such as plant fossils in growth position in roof shales of coal beds, or unusual associations of fossils, as in limestone concretions or coal balls. It is important, therefore, that operations be monitored for such discoveries (see Recommendations, below).

The possibility always exists that excavation may expose interesting accumulations of fish remains in fissile shales, but the probability of this in the area of most

grow are in combination with [illegible] [illegible] [illegible], and [illegible] will vary from area to area and [illegible] to the limited data [illegible].

SEASONAL VARIATIONS

The important [illegible].

IMPORTANCE OF ANIMAL PERFORMANCE

We have thus [illegible].

The [illegible]

intense interest seems remote owing to the prevalence of moderately deep water depositional environments (Zidek, personal communication).

RECOMMENDATIONS

1. Large-scale field reconnaissance of the Federal Coal Reserves area is not justified on the basis of existing references in the paleontological literature.

2. Limited examinations of the following localities should be conducted by qualified experts (we cannot estimate the current conditions at any of these localities if in fact they still exist): Localities 3, 4, 7, 27, 32, 34, 67, 68, 74, 103, 105?, 106?, 107?, 114.

3. Those responsible for leasing lands in the affected areas should be alerted to the fact that most fossil occurrences are isolated and relatively small-scale. Discoveries may be made at any time, in limestone (invertebrates), coal and shales (plants), and sandstones (invertebrates and trace fossils). Hence it is recommended that those engaged in mining and other development be required to contact authorities upon the fortuitous discovery of fossil material in their workings.

4. Contracts should provide for funding of necessary salvage works in the event of significant fossil discoveries in the area.

5. Individuals who may be in a position to assist in site examination and salvage are:

Invertebrate fossils

Dr. Ellis Yochelson
U.S. Geological Survey
E-501 Museum of Natural History
Washington, D.C. 20560

Prof. J. D. Naff
Department of Geology
Oklahoma State University
Stillwater, Oklahoma

Dr. H. L. Strimple (echinoderms)
Department of Geology
University of Iowa
Iowa City, Iowa 52242

Palynology

Prof. L. R. Wilson
School of Geology and Geophysics
University of Oklahoma
Norman, Oklahoma

Paleobotany

Dr. Sergius H. Mamay
U.S. Geological Survey
Washington, D.C. 20242

Paleoentomology

Dr. C. J. Durden
Texas Memorial Museum
24th & Trinity Streets
Austin, Texas 78712

Vertebrate fossils

Dr. Jiri Zidek
School of Geology and Geophysics
University of Oklahoma
Norman, Oklahoma

APPENDIX A: LOCALITIES

Localities are listed in approximately the same sequence as the references discussed in the text (History of Research). The legal description of each locality is followed by the topographic quadrangle name, if the area is mapped. This is followed by stratigraphic data and a brief notation of the fossils reported from the locality. An asterisk (*) indicates a locality of special significance, for example, the type locality of a new species.

Locality numbers correspond to numbers on the accompanying maps (Appendix B). The following localities listed in Appendix A are not shown on the maps either because of insufficient data, absence of mapping, or the locality is judged relatively unimportant: 37, 41, 42, 54, 61, 69, 70-73, 78, 80, 82-84, 86, 87, 90, 97, 119, 120, 126, 127.

Localities 1 through 8 are plant megafossil collecting areas recorded in White (1899). The largest collections and most important materials are from localities 1-5, according to White (p. 457). Legal descriptions (given in parentheses) are inferred from the limited information available in White's text and from maps in Taft (1899, Plates 64 & 65).

Locality	Description
*1	½ mile W of McAlester; (several mines are shown on Taff's map, Pl. 64, probably N½ SE¼ sec. 36, T 6 N, R 14 E), Pittsburg Co., McAlester quad. Roof of McAlester coal, McAlester Fm. 29 species of plants, including 5 new species: <u>Mariopteris capitata</u> (U.S.N.M. Reg. 6514), <u>Sphenopteris taffii</u> (U.S.N.M. Reg. 6440, 6441), <u>Pecopteris richardsoni</u> (U.S.N.M. Reg. 6423, 6426, 6427), <u>Sphenophyllum suspectum</u> (U.S.N.M. Reg. 6431, 6747), and <u>Mariopteris occidentalis</u> (U.S.N.M. Reg. 6435). White, 1899, pp. 482, 485, 492, 522, 480.

Locality	Description
2	Krebs No. 11 mine, (probably E½ SE¼ sec. 4, T 5 N, R 15 E), Pittsburg Co., Krebs quad. Roof of McAlester coal, McAlester Fm. 15 species of plant megafossils, none new. White, 1899, pp. 460-461.
*3	Cherryvale, (probably N line, NW¼ sec. 7, T 5 N, R 16 E), Pittsburg Co., Krebs quad. Roof of McAlester coal, McAlester Fm. 13 fossil plant species, including 2 new species: <u>Mariopteris occidentalis</u> (U.S.N.M. Reg. 6603) and <u>Pecopteris richardsoni</u> (U.S.N.M. Reg. 6605). White, 1899, pp. 480, 492.
4	Savanna, (probably mine, cen. N½ sec. 16, T 4 N, R 14 E), Pittsburg Co., Savanna quad. Roof of McAlester coal, McAlester Fm. 11 fossil plant species, including 2 new species: <u>Sphenopteris taffii</u> (U.S.N.M. Reg. 6566) and <u>Sphenophyllum suspectum</u> (U.S.N.M. Reg. 6431, 6747). White, 1899, pp. 485, 522.
5	Alderson, west mine, (probably W side SW¼ sec. 14, T 5 N, R 15 E), Pittsburg Co., Krebs quad. Roof of McAlester coal, McAlester Fm. One plant fossil species, <u>Alethopteris serlii</u> (Brongn.) Goepp, p. 499, (U.S.N.M. Reg. 6736). White, 1899, pp. 460-461.
*6	½ mi. S of South McAlester, railroad cut, (probably NW¼, NW¼ Sec. 7, T 5 N, R 15 E), Pittsburg Co., McAlester quad. "Upper bed," about 2000 ft. above McAlester coal, McAlester Fm. 15 species of fossil plants, including one new species: <u>Lepidodendron choctavense</u>, p. 528, (U.S.N.M. Reg. 6752). "Lower bed" contains 4 species of plants, none new, pp. 460-461. White, 1899.
*7	2 mi. E of Krebs, NW¼ sec. 12, T 5 N, R 15 E, Pittsburg Co., Krebs quad. Roof of Grady coal, McAlester Fm. 19 species of fossil plants, one species is new: <u>Neuropteris harrisi</u>, p. 506, (U.S.N.M. Reg. 6684). White, 1899.

Locality	Description
8	Mine No. 12, 2 mi. SE of Krebs, SW¼ sec. 12, T 5 N, R 15 E, Pittsburg Co., Krebs quad. 1500 ft. below McAlester coal, and roof of Grady coal, McAlester Fm. 3 species of plant fossils, one new variety: <u>Mariopteris occidentalis villosa</u>, p. 482, (U.S.N.M. Reg. 6748-6750). White, 1899.
	Localities 9 through 24 are from Girty, 1899. Note that new species are known from more than one locality.
9	Cherryvale, rr. cut midway between the two mines, (N side, NW¼, NW¼ sec. 7, T 5 N, R 16 E), Pittsburg Co., Krebs quad. Shale bed 50 ft. below McAlester coal, McAlester Fm. 7 species of invertebrates, mostly brachiopods, none new. Girty, 1899, p. 541.
10	N side of Krebs,(? SW¼ sec. 3, T 5 N, R 15 E), Pittsburg Co., Krebs quad. Shale bed 50 ft. below McAlester coal, McAlester Fm. 15 species of invertebrates: brachiopods and bivalves, no new species. Girty, 1899, p. 541.
11	Cen. E side of sec. 10, T 2 S, R 10 E, Atoka Co., Lehigh quad. A shale bed "associated with coal, ? roof shale of Grady or Hartshorne coal mine." Only one species, the cephalopod <u>Stearoceras gibbosum</u>, Girty, 1899, p. 541.
*12	N side of sec. 36, T 1 S, R 10 E, Coal Co., Lehigh quad. Roof of Lehigh coal, McAlester Fm. 8 species of invertebrates, mostly molluscs. Bivalves include 2 new species: <u>Schizodus meedanus</u> (p. 583, Pl. 72, figs. 7a-7c) and <u>Pleurophorus taffi</u> (p. 584, Pl. 72, figs. 2a-2c). Girty, 1899.
13	Mine No. 6½, sec. 2, T 1 S, R 10 E, Coal Co., Coalgate quad. Roof of Lehigh coal, McAlester Fm. 10 species of invertebrates, including corals, brachiopods, gastropods, and cephalopods. No new species. Girty, 1899, p. 541.

Locality	Description
14	Mine No. 5, Lehigh, (NW¼, NE¼ sec. 14, T 1 S, R 10 E), Coal Co., Lehigh quad. Roof of Lehigh coal, McAlester Fm. 4 species of bivalves, none new. Girty, 1899, p. 542.
*15	Sec. 11, T 1 S, R 10 E, Coal Co., Lehigh quad. Roof of Lehigh coal, McAlester Fm. 2 species of bivalves, one new: *Schizodus meekanus* (p. 583, Pl. 72, figs. 7a-7c). "Fish plates." Girty, 1899, p. 542.
16	¼ mi. or less W of Krebs station on Choctaw Railway (? Sec. 3, T 5 N, R 15 E), Pittsburg Co., Krebs quad. Above Lehigh coal, McAlester Fm. 5 species of invertebrates, brachiopods and crinoids. Fossils "entire and perfectly preserved," p. 542. Girty, 1899.
*17	SE¼, SE¼ sec. 19, T 2 N, R 13 E, Atoka Co., Limestone Gap quad. Lower portion of Savanna Ss. 17 species of invertebrates. A diverse assemblage including one new species of bivalve: *Pleurophorus taffi* (p. 584, Pl. 72, figs. 2a-2c). Girty, 1899, p. 542.
*18	SW corner of sec. 4, T 2 S, R 11 E, Atoka Co., Lehigh quad. Lower portion of Savanna Ss. 21 species of brachiopods and mulluscs, including one new species of bivalve: *Pleurophorus taffi* (p. 584, Pl. 72, figs. 2a-2c). Girty, 1899, p. 542.
*19	SW¼, SW¼ sec. 4, T 2 S, R 11 E, Atoka Co., Lehigh quad. Lower portion of Savanna Ss. Diverse assemblage (24 species) of brachiopods and molluscs, including 2 new species of bivalve: *Schizodus meekanus* (p. 583, Pl. 72, Figs. 7a-7c), Girty, 1899, p. 543.
20	SE¼, NE¼ sec. 11, T 2 N, R 12 E, Atoka Co., Wardville quad. Boggy Sh. 5 species of brachiopods and molluscs, none new. Girty, 1899, p. 543.

Locality	Description
*21	Boggy Ck., on line between secs. 23 and 24, T 2 N, R 12 E, Atoka Co., Wardville quad. Boggy Sh. 4 species of molluscs, including one new species of bivalve: Schizodus meekanus (p. 583, Pl. 72, figs. 7a-7c), Girty, 1899, p. 543.
*22	On line between secs. 24 and 25, T 5 N, R 12 E, Pittsburg Co., Haywood quad. Boggy Sh. 3 bivalve species, one new: Pleurophorus taffi (p. 584, Pl. 72, figs. 2a-2c). Girty, 1899, p. 543.
*23	E fork of Boggy Ck., on line between secs. 23 and 24, T 2 N, R 11 E, Coal Co., Wardville quad. Upper Coal Measures (Boggy Sh.) 6 species of bivalves and gastropods, including 3 new species: Schizodus telliniformis (p. 583, Pl. 72, fig. 6a), S. pandatus (p. 583, Pl. 72, fig. 5a), and S. meekanus (p. 583, Pl. 72, figs. 7a-7c). Girty, 1899, p. 543.
*24	Near Lehigh, about ½ mi. S of Coal Ck., E of the rr. (SE¼ sec. 25, T 1 S, R 10 E), Coal Co., Lehigh quad. Upper Coal Measures (McAlester Fm.). One new bivalve species, Schizodus meekanus (p. 583, Pl. 72, figs. 7a-7c). Girty, 1899, p. 543.
25	On S side of Hartshorne ss. ridge, S½ sec. 9, T 5 N, R 17 E, Pittsburg Co., Adamson quad. Atoka Fm. Shales contain much fragmental plant material including fern leaves. Hendricks, 1937, p. 10.
26	Sec. 30, T 4 N, R 15 E, Pittsburg Co., Savanna quad. Atoka Fm. Plant stem fragments, Hendricks, 1937, p. 10.
*27	E line of sec. 13, 500 ft. S of NE corner, T 3 N, R 14 E, Pittsburg Co., Pittsburg quad. Hartshorne ss. Plant fossils are abundant in the shale just above the Lower Hartshorne coal, section includes worm tubes and the brachiopod, Lingual carbonaria. Hendricks, 1937, p. 13.

Locality	Description
28	Coll. 1. In creek bed 100 ft. S of old road, NE¼ NE¼ NW¼ sec. 17, T 3 N, R 13 E, Pittsburg Co., Kiowa quad. Upper part of McAlester sh. 14 species of invertebrates listed. Hendricks, 1937, p. 16.
29	Coll. 2. In creek bed about 400 yds. S of old road, SE¼ NE¼ sec. 17, T 3 N, R 13 E, Pittsburg Co., Kiowa quad. Upper part of McAlester Sh. 28 species of invertebrates listed, including crinoids, bryozoans, brachiopods, and bivalves. Hendricks, 1937, p. 16.
30	Coll. 3. Mine dump N of road, SE¼ SE¼ SW¼ sec. 3, T 5 N, R 16 E, Pittsburg Co., Adamson quad. Upper part of McAlester sh., zone just above McAlester coal. Plant fossils abundant, 3 species of invertebrates. Hendricks, 1937, p. 16.
31	Coll. 1. NE¼ SW¼ sec. 3, T 3 N, R 13 E, Pittsburg Co., McAlester SW quad. Basal portion of the Savanna ss. 9 species of invertebrates including brachiopods and bivalves. Hendricks, 1937, p. 20.
*32	Coll. 2. SE¼ NE¼ sec. 4, T 2 N, R 13 E, Atoka Co., Kiowa quad. Lower portion of Savanna ss. Diverse fauna consisting of 46 species of invertebrates. Hendricks, 1937, p. 20.
33	Coll. 3, NE¼ NW¼ sec. 3, T 2 N, R 13 E, Atoka Co., Kiowa quad. Middle portion of the Savanna ss. Diverse invertebrate fauna (26 species) includes cephalopods. Hendricks, 1937, p. 20.
*34	Coll. 4, NE¼ SE¼ sec. 23, T 5 N, R 15 E, Pittsburg Co., Krebbs quad. Basal portion of Savanna ss. The diverse fauna of invertebrates (26 species) includes crinoids (<u>Agassizocrinus</u>), brachiopods, bivalves, gastropods and cephalopods. Hendricks, 1937, p. 21.

Locality	Description
35	E side sec. 5, T 5 N, R 16 E to sec. 32, T 6 N, R 16 E, Pittsburg Co., Krebs quad. Sandstone interval in middle of Savanna ss. Plant fossils common: Calamites, Sigillaria, fern fragments; poorly-preserved invertebrates. Hendricks, 1937, pp. 21-22.
36	W side sec. 3, T 3 N, R 13 E, Pittsburg Co., McAlester SW quad. Savanna Ss. Shales in this area are reported to have "considerable plant material." Hendricks, 1937, p. 22.
37	NW corner T 3 N, R 13 E, Pittsburg Co., Kiowa quad. Boggy Sh. Sandstone beds in this area contain worm trails, fucoids, and fragments of plant fossils: Sigillari, Lepidodendron, and Calamites. Hendricks, 1937, p. 23.
38	Coll. 1. SW¼ SW¼ sec. 5, T 4 N, R 15 E, Pittsburg Co., Savanna quad. Boggy sh., in shale 500 ft. above base. 4 species of brachiopods. Hendricks, 1937, pp. 23, 24.
39	Coll. 2. 1000 ft. W of NW corner of sec. 12, T 4 N, R 15 E, Pittsburg Co., Hartshorne SW quad. Boggy sh., in shale 1000 ft. above base. 11 species of invertebrates: brachiopods and cephalopods. Hendricks, 1937, p. 24.
40	Coll. 3. SW¼ SE¼ sec. 5, T 4 N, R 15 E, Pittsburg Co., Savanna quad. Boggy sh., in shale 700 ft. above base. 11 species of invertebrates: brachiopods, bivalves, and Goniatites sp. Hendricks, 1937, pp. 23, 24.
41	NW corner T 2 S, R 11 E, Atoka Co.; T 3 N, R 11 and 12 E, Pittsburg Co.; SW corner T 1 N, R 9 E, Coal Co.; McAlester Sh., especially calcareous layer in roof of Lehigh coal bed. "Rather abundant" plants, invertebrates, and fish teeth. Knechtel, 1937, pp. 103-105.

Locality	Description
42	Sec. 1, 2, 3, T 1 S, R 9 E, Coal Co., Olney quad. Savanna Ss. Lenses of very fossiliferous limestone occur near the middle of the formation in the western part of the area. Knechtel, 1937, p. 105.
43	No. 7936. Roadside ditch on N side of road, S line of sec 36, T 8 N, R 18 E, Pittsburg Co., Enterprise quad. Savanna Ss. 1½ ft.-thick limestone very fossiliferous, 150-180 ft. below top. Invertebrate fossils include the brachiopods _Marginifera sp._ and _Spirifer sp._ and crinoid columnals; 11 species. Dane et al., 1938, pp. 160, 172, 173, 189.
*44	No. 7937. Along Quinton-Wilburton road, NW¼ sec. 7, T 7 N, R 19 E, Haskell Co., Quinton S quad. Savanna Ss, with a few ft. of base. This assemblage is diverse (25 species), with many common taxa including the coral _Lophophyllum_, crinoid columnals, and brachiopods. Dane et al., 1938, pp. 171, 172, 189.
*45	No. 7939. Same as locality 43 except near crest of hill and 15 ft. above pipe line. Savanna Ss., 10-in. limestone 12 ft. above the limestone of locality 21. An unusual assemblage consisting mostly of ramose bryozoans and a few molluscs: brachiopods appear to be absent. 6 species. Dane et al., 1938, pp. 172, 173, 189.
46	No. 7943. ½ mi. SE of Featherston, along section-line road between secs. 14 and 23, T 7 N, R 17 E, Pittsburg Co., Featherston quad. 8-in. limestone 80-100 ft. below top. Crinoid columnals and the brachiopod _Spirifer_ are common. Dane et al., 1938, pp. 172,189.
47	No. 8025. Coal mine 900 ft. S and 600 ft. E from NW corner of sec. 6, T 8 N, R 18 E, Haskell Co., Enterprise quad. Boggy Sh., limestone above coal 200-250 ft. above Secor coal. A rather diverse

Locality	Description
cont. 47	(10 species) fauna including crinoid columnals, brachiopods, and gastropods. Dane et al., 1938, pp. 176, 177, 190.
*48	No. 8028. SW¼ sec. 10, T 6 N, R 15 E, Pittsburg Co., Crowder quad. Boggy Sh., black shales just above Secor coal. This assemblage is unusual because it indicates a nonmarine environment at this horizon. The collection includes the bivalves *Naiadites* and *Aviculipecten*, and fern pinnules. Dane et al., 1938, pp. 174, 176, 177, 190.
49	No. 8029. Strip pit, SE¼ sec. 19, T 8 N, R 18 E, Pittsburg Co., Enterprise quad. Boggy Sh., shale just above Secor coal. 6 species of bivalves and gastropods are listed as "rare." Dane et al., 1938, pp. 176, 177, 190.
50	No. 8030. Abandoned mine on hillside, SE¼ sec. 21, T 6 N, R 16 E, Pittsburg Co., Adamson quad. Boggy Sh., shales 3 ft. above Secor coal. The bivalve *Aviculipecten* is common. Dane et al., 1938, pp. 176, 177, 190.
51	No. 8032. Lochmanese coal mine, SE¼ sec. 29, T 7 N, R 16 E, Pittsburg Co., Crowder quad. Boggy Sh., black shales just above Secor coal. A rather diverse (12 species) assemblage of invertebrates dominated by the brachiopods *Lingula* and *Crurithyris* and the bivalves *Aviculipecten* and *Limatula*? Dane et al., 1938, pp. 176, 177, 190.
52	Along Ck, above coal bed, SW¼ sec. 28, T 7 N, R 16 E, Pittsburg Co., Crowder quad. Boggy Sh., shale 30-50 ft. above Secor coal. 9 species of invertebrates. The bivalve *Aviculipecten* is common. Dane et al., 1938, pp. 176, 177, 190.
*53	No. 8037. Hill on E side of Bull Ck., SE¼ sec. 36, T 7 N, R 13 E, Pittsburg Co., Scipio quad. Boggy Sh., thin sandstone 350 ft. below top. The bivalve *Allerisma terminale* is common. This

Locality	Description
cont. 53	assemblage from Boggy Sh. sandstones that are considered "undoubtedly marine." Dane et al., 1938, pp. 174, 176, 177, 190.
54	No. 8093. Along a section-line road, 300 ft. S of NW corner of sec. 24, T 8 N, R 15 E, Pittsburg Co., Canadian quad. Boggy Sh., sandstone 1200-1400 ft. above Secor coal. Naiadites? elongata Dawson, a fresh- to brackish-water bivalve is abundant. Dane et al., 1938, pp. 176, 177, 191.
55	No. 8040. In roadside ditch near hill top, NE¼ sec. 34, T 8 N, R 17 E, Pittsburg Co., Enterpirze quad. Boggy Sh., limestone above coal 200-250 ft. above the Secor coal. The coral Lophophyllum and the brachiopod Marginifera are common in this assemblage. 5 species. Dane et al., 1938, pp. 176, 177, 191.
56	No. 8046. S side of small stream, NW¼ of sec. 8, T 6 N, R 16 E, Pittsburg Co., Crowder quad. Boggy Sh., top of Secor coal and 5-ft.-thick shale just above Secor coal. A small collection (5 species) dominated by gastropods. Dane et al., 1938, pp. 176, 177, 191.
57	No. 8047. On W side of hill, roadside ditch, N line of sec. 33, T 7 N, R 13 E, Pittsburg Co., Scipio quad. Thurman Sandstone, 130 ft. above base. The brachiopod Linoproductus and the bivalve Schizodus are common in this assemblage. 11 species. Dane et al., 1938, pp. 179, 191.
58	No. 8048. Near W sec. line of sec. 28, T 7 N, R 13 E, Pittsburg Co., Scipio quad. Thurman Sandstone, 40 ft. below top. A large collection of invertebrates, including bivalves and gastropods, but dominated by the brachiopods Lingula and Marginifera. Dane et al., 1938, pp. 179, 191.

Locality	Description
59	No. 8050. N side of road along N line of sec. 14, T 7 N, R 13 E, Pittsburg Co., Scipio quad. Thurman Sandstone, shale 30 ft. above base. A relatively small collection (6 species), dominated by the brachiopod Chonetes but including rare bivalves. Dane et al., 1938, pp. 179, 191.
60	No. 8051. Roadside ditch along the north line of sec. 34, T 7 N, R 13 E, Pittsburg Co., Scipio quad. Thurman Sandstone, 65 ft. above base. 11 species of invertebrates (brachiopods, bivalves, and gastropods). Dane et al., 1938, pp. 179, 191.
61	No. 8054. Crest of hill, SE¼ sec. 3, T 7 N, R 14 E, Pittsburg Co., Lake McAlester quad. Thurman Ss., 190 ft. above base. 8 species of invertebrates, fauna dominated by bivalves. Dane et al., 1938, pp. 179, 192.
62	No. 8056. Along a N-S road, NE¼ sec. 32, T 8 N, R 13 E, Pittsburg Co., Hanna quad. Stuart Sh., nodular bed 50 ft. above base. 7 species of invertebrates (brachiopods, bivalves, and cephalopods) are listed. Dane et al., 1938, pp. 181, 192.
63	No. 8057. Along road, E line of sec. 32, T 8 N, R 13 E, Pittsburg Co., Hanna quad. Stuart Sh., probably 175 ft. above base. Invertebrate fauna dominated by bivalves. 5 species. Dane et al., 1938, pp. 181, 192.
64	No. 8059. Thin sandstone below thick sandstone that caps hill, SE¼ sec. 33, T 8 N, R 13 E, Pittsburg Co., Hanna quad. Stuart Sh., 145 ft. above base. Pelecypod molds are locally very abundant and dominate the fauna (11 species). Gastropods (5 species) are also reported. Dane et al., 1938, pp. 181, 192.

Locality	Description
65	No. 8060. Roadside ditches along N side of sec. 30, T 7 N, R 13 E, Pittsburg Co., Scipio quad. Stuart Sh., nodular zone 106 ft. above base. The invertebrate fauna is dominated by productid brachiopods, bivalves are also found. 8 species. Dane et al., 1938, pp. 180, 181, 192.
66	No. 8061. At top of isolated hill, NW¼ sec. 9, T 7 N, R 13 E, Pittsburg Co., Scipio quad. Thurman Ss, 175 ft. above base. Invertebrate fauna consisting of 9 species of brachiopods and bivalves. Dane et al., 1938, pp. 179, 192.
*67	Pine Mountain strip pit, sec. 26, T 5 N, R 25 E, Le Flore Co., Heavener quad. Hartshorne Ss., contact between Lower Hartshorne coal and overlying shale. Abundant plant fossils, including upright Calamites and Cordaites trunks. Hendricks, 1939, pp. 265, 268, Pl. 29, B.
*68	Near cen. N½ sec. 31, T 7 N, R 23 E, Le Flore Co., Potato Peaks quad. Sandstone in upper part of the McAlester Sh. Fossil stump 2½ ft. in diameter. Hendricks, 1939, p. 268, Pl. 31, A.
69	In the bed of Turkey Ck., 500 ft. N of bridge, cen. sec. 33, T 6 N, R 22 E, Latimer Co., McCurtain SW quad. McAlester Sh. The best exposure of lenticular beds of fossiliferous limestone in this district. Hendricks, 1939, p. 269.
	Localities 70 through 73 (Knechtel, 1949) are very generalized descriptions, but are included because they are in the area of most intense interest.
70	N side of Highway No. 9, NW¼, SE¼ sec. 24, T 9 N, R 24 E, Le Flore Co., Panama quad. Atoka Fm, near top. Abundant marine fossils in limestone lens above standstone. Knechtel, 1949, p. 14.

Locality	Description
71	In road cut in sec. 22, T 8 N, R 24 E, 2½ miles SE of Bokoshe, Le Flore Co., Bokoshe quad. McAlester Fm. (McCurtain Shale Member). Calcareous marine fossiliferous layer in lower part of sandy zone. Knechtel, 1949, p. 20.
72	Along US 270 between Poteau and Howe, W½ SW¼ sec. 11, T 6 N, R 25 E, Le Flore Co., Poteau W quad. McAlester Fm. Marine invertebrates (including pelecypods) and plant remains, such as Calamites stem fragments. Knechtel, 1949.
73	Along road, E½ SW¼ sec. 11, T 7 N, R 23 E, Le Flore Co., Potato Peaks quad. Savanna Fm. (upper). Plant remains, including Sigillaria. Knechtel, 1949.
**74	(f 12369B, 12/4/56, U.S.G.S. Coll. of Foraminifera/U.S.G.S. Paleobot. Coll. 8764) Small abandoned slope mine near the abandoned rr. station of Chambers, approx. 4 mi. S-SE from McAlester; near the common corner of secs. 26, 27, 34 and 35, T 5 N, R 14 E, Pittsburg Co., Savanna quad. Boggy Sh., lower part. Limestone cap rock of the Secor coal. About 150 nodules and chunks of limestone coll. by C. B. Read in 1939. Includes mixed coal balls (= containing both plant and animal remains) found nowhere else in Oklahoma. Fossils include a new group of algae, sessile foraminifera, spores of Triletes, brachiopods, bryozoans, gastropods, ostracods, conodonts, and fish remains (indeterminate cladoselachian, bradyodont, and xenocanth sharks, acanthodians and palaeoniscoids). Henbest, 1958; Mamay, 1959; Mamay and Yochelson, 1962; Zidek, 1972.
75	Coll. 27. Roadcut on U.S. Highway 59, ½ mi. N of Poteau River, NW¼, SE¼, NW¼ sec. 36, T 5 N, R 25 E, Le Flore Co., Heavener quad. Hartshorne

Locality	Description
cont. 75	coal, Pecopteris dominates the flora; also many Stigmaria and Calamites. Bradshaw, 1977, personal communication.
76	Coll. 30 SE¼, SW¼, NW¼ sec. 13, T 10 N, R 20 E, Haskell Co., Stigler W quad. Hartshorne coal, "Seems characteristic of Hartshore sites in this area in that it contains many poor to moderately well preserved Neuropteris ovata, Cordaites, Annularia stellata, and Sphenophyllum emarginatum." Bradshaw, 1977, personal communication.
77	? Coll. 41. Railroad cut ½ mi. W of Hartshorne, (NW¼, SW¼, NW¼ sec. 35, T 5 N, R 16 E), Pittsburg Co., Hartshorne quad. Lower McAlester Fm. Plant megafossils in fossiliferous concretions. Bradshaw, 1977, personal communication.
*78	Girty's Loc. 2047. In creek bed, N of cen. of sec. 16, T 3 N, R 18 E, Latimer Co., Sardis quad. Caney Sh. New species: Caneyella nasuta (bivalve), p. 37, Pl. 3, figs. 12, 12a, 13, 14; Gastrioceras caneyanum (cephalopod), p. 57, Pl. 12, figs. 4-10. Girty, 1909.
*79	Girty's Loc. 2057. SW¼ SW¼ sec. 17, T 4 N, R 22 E, Le Flore Co., Red Oak quad. Caney Sh., limestone lenses in black shale. New species: Caneyella wapanuckensis, n. gen., n. sp. (bivalve), p. 34, Pl. 3, figs. 6-11; Gastrioceras richardsonianum , p. 54, Pl. 11, figs. 1-11; Eurmorphoceras bisulcatum, n. gen., n. sp. (cephalopod), p. 68, Pl. 11, figs. 15-19a. Girty, 1909.
*80	Girty's Loc. 2075. Valley of Caney Ck., SW¼ sec. 2, T 1 S, R 16 E, Pushmataha Co., Dunbar quad. Caney Sh., middle and lower part. New species: Caneyella wapanuckensis, n. gen., n. sp. (bivalve); Orthoceras caneyanum (cephalopod), p. 45, pl. 6, figs, 7, 8; Gastrioceras richardsonianum (cephalopod); Eurmorphoceras bisulcatum. Girty, 1909.

Locality	Description
*81	Grity's Loc. 2076. SW¼ sec. 36, T 2 S, R 9 E, Atoka Co., Boggy Depot quad. Caney Sh. New species: Gastrioceras richardsonianum (cephalopod). Girty, 1909.
*82	Girty's Loc. 2078. Small run corssing chert ridge, near cen. sec. 4, T 2 N, R 15 E, Pittsburg Co. Concretions in lower part of Caney Sh. New species: Caneyella wapanuckensis, n. gen., n. sp. (bivalve); C. vaughani, p. 35, Pl. 4, figs. 7-10; C. percostata, p. 37, Pl. 4, figs. 2-6; C. richardsoni, p. 38, Pl. 4, figs. 1, 1a; Orthoceras caneyanum; O. crebriliratum, p. 46, Pl. 6, figs. 9-10; O. indianum, p. 47, Pl. 6, figs. 13, 13a; Gastrioceras caneyanum, Adelphoceras meslerianum, p. 66, Pl. 12, figs. 1-3c; Trizonoceras lepidum, p. 71, Pl. 11, figs. 13-14a. Girty, 1909; Branson et al., 1959.
*83	Girty's Loc. 2079. Along tributaries to Elm Ck., NE¼ sec. 20, T 3 N, R 16 E, Pittsburg Co. ?Lower Caney Sh. New species: Caneyella wapanuckensis; Orthoceras caneyanum; Gastroioceras richardsonianum; G. caneyanum; Eurmorphoceras bisulcatum; Trizonoceras lepidum. Girty, 1909. Stethacanthus sp., spine (U.S.N.M. 8110), collected by Girty, may also have come from this locality. Eastman (1917), Zidek (1972, p. 173).
*84	Girty's Loc. 3948. Boulders, NW¼ sec. 19, T 1 S, R 14 E, Atoka Co., Lane NE quad. Caney Sh. New species: Caneyella wapanuckensis; Gastrioceras richardsonianum; Eurmorphoceras bisulcatum; Trizonoceras tipicale, p. 70, Pl. 11, figs. 12, 12a, 12b. Girty, 1909.
*85	Girty's Loc. 3982. Windingstair Mt., E½ sec. 32, T 4 N, R 20 E, Latimer Co., Red Oak quad. Caney Sh. New species: Gastrioceras richardsonianum. Girty, 1909.

Locality	Description
*86	Girty's Loc. 3983. Branch of Caney Ck. SE¼ sec. 4, T 1 S, R 16 E, Pushmataha Co., Dunbar quad. Caney Sh. New species: _Caneyella nasuta_. Girty, 1909.
*87	Girty's Loc. 3984. Caney Ck. Branch. SW¼ sec. 3, T 1 S, R 16 E, Pushmataha Co., Dunbar quad. Caney Sh. New species: _Gastrioceras caneyanum_; _Adelphoceras meslerianum_. Girty, 1909.
*88	Girty's Loc. 3985. In railroad cut near Compton, SE¼ sec. 18, T 4 N, R 22 E, Le Flore Co., Red Oak quad. Caney Sh. New species: _Gastrioceras richardsonianum_. Girty, 1909.
*89	Hartshorne Quarry, 2 mi. S of Hartshorne, NW¼ sec. 18, T 4 N, R 17 E, Pittsburg Co., Hartshorne quad. Wapanucka Ls., shale near base. New species of ostracodes: _Paraparchites wapanuckaensis_ (U.S.N.M 72233), "characteristic of Wapanucka Ls." Harlton, 1928; _Amphissites wapanuckaensis_, Harlton, 1929; _Seminolites subtriangularis_ (U.S.N.M. 79368), Harlton, 1929; _Bairdia conilata_ (U.S.N.M. 79373), Harlton, 1929.
90	Cen. of S line of sec. 4, T 1 S, R 8 E, Coal Co., Wapanucka N quad. Wapanucka Ls. One new species of ostracode, _Kirkbyina spinosa_ (U.S.N.M. 79363), Harlton, 1929.
	Localities 91 through 94 are from Harlton (1933) and Harris and Holingsworth (1933). Fossils listed are fish species, originally described by Harlton as conodonts because conodonts were then considered to be fish, and reviewed in Zidek, 1973a.

Locality	Description
*91	In Limestone Gap, SW¼ NE¼ sec. 31, T 2 N, R 13 E, Atoka Co., Limestone Gap quad. Johns Valley Sh. (Harlton, 1933), Lower part of Wapanucka Ls. or possibly upper part of Goddard Sh. (Zidek, 1972, p. 175). New species: Multidentodus brevis Harlton (U.S.N.M. 85524), cladoselachian dermal denticle (Zidek, 1973a); Holmesella triangularis Harlton (U.S.N.M. 85527); H. wapanuckensis Harlton (U.S.N.M. 85528); Harlton (1933).
*92	Wards Ck., gap in Limestone Ridge ½ mi. S of Reynolds, cen. sec. 10, T 2 N, R 13 E, Atoka Co., Kiowa quad. Johns Valley Sh. (Harlton, 1933), Lower part of Wapanucka Ls. or possibly upper part of Goddard Sh. (Zidek, 1972, p. 175). New species: Multidentodus wapanuckensis Harlton (1933, Pl. 3, figs. 2, 4), U.S.N.M. 8552, mucous membrane denticle of cladoselachian form (Zidek, 1973a).
*93	Base of Hartshorne Ls. Quarry, cen. N½ sec. 18, T 4 N, R 17 E, Pittsburg Co., Hartshorne quad. Johns Valley Sh., shale underlying Wapanucka Ls. (Harlton, 1933), Lower part of Wapanucka Sh. or possibly upper part of Goddard Sh. (Zidek, 1972, p. 175). New species: Multidentodus irregularis Harlton (U.S.N.M. 85525), mucous membrane denticles of cladoselachian form (Zidek, 1973a).
*94	NE¼ sec. 13, T 1 N, R 10 E, Coal Co., Coalgate quad. Boggy Fm. New species: Ichyodus gunneli Harris & Hollingsworth (U. Okla. Paleo. Coll. 1501), teeth of bony fish (Zidek, 1973a, p. 93).
95	W½, NE¼ sec. 19, T 3 N, R 15 E, Pittsburg Co., Pittsburg quad. Wapanucka Fm. Agassizodus variabilis Newberry & Whorten, lateral tooth (O.U.S.M. 00562). Zidek, 1976.

Locality	Description
96	SE¼, NW¼ sec. 10, T 2 N, R 13 E, Atoka Co., Kiowa quad. Uppermost part of Wapanucka Fm. Janassa sp. Münster. Incomplete lateral tooth (O.U.S.M. 00561). Zidek, 1976.
97	Unknown; south-central or southeastern Oklahoma; western-northwestern margin of Ouachita Mountains. ?Woodford Sh. (Upper Devonian). Coccosteus-like antero-ventro-lateral plates (Eastman, 1917, p. 255, Pl. 10, figs. 5, 6; Zidek, 1973b, fig. 1). U.S.N.M. 8107.
98	Abandoned quarry, NW¼ SE¼, NE¼ sec. 33, T 5 N, R 18 E, Latimer Co., Higgins quad. Wapanucka Ls. Algae, encrusting foram Hedraites, brachiopods, molluscs, echinoderms, bryozoans. Shelton & Rowland, 1974, p. 53.
99	Abandoned quarry S½ NE¼ NW¼ sec. 18, T 4 N, R 17 E, Pittsburg Co., Hartshorne quad. (also other quarries in area). Wapanucka Ls. Sponge spicules, foraminifera, radiolarians, crinoid parts. Shelton & Rowland, 1974, p. 49.
100	Ridge, about 20 yds S of sec. line fence at N line of NW¼ of sec. 19, T 1 S, R 9 E, Coal Co., Wapanucka N quad. Wapanucka Ls. Brachiopods, crinoid parts, corals. Rowett, 1962, p. 228.
101	Abandoned Ls. quarry center SE¼ NW¼ SE¼ sec. 6, T 1 S, R 9 E, Coal Co., Wapanucka N Quad. Upper Wapanucka Ls. Paragassizocrinus, productid and chonetid brachiopods. Rowett, 1962, p. 226.
102	Large quarry N½ NW¼ sec. 17, T 4 N, R 17 E, Pittsburg Co., Hartshorne quad. Wapanucka Ls. Corals, crinoid parts, trilobites, bryozoans, pelecypods, brachiopods (preservation poor). Rowett, 1962, p. 263.

Locality	Description
103	Quarry, center NW¼ sec. 18, T 4 N, R 17 E, (another quarry 1 mile E), Pittsburg Co., Hartshorne quad. Wapanucka Ls. Corals, brachiopods, bryozoans, crinoid parts, trilobites, plant material (including segments of stems and trunks). Rowett, 1962, p. 259.
104	Ridge, SW part NW¼ sec. 18, T 1 S, R 9 E, Coal Co., Wapanucka N quad. Wapanucka Ls. Brachiopods, corals, complete crinoids (Delocrinus). Rowett, 1962, p. 227.
105	Two rr. cuts on ridge, NE¼ sec. 31, T 2 N, R 13 E, Atoka Co., Limestone Gap quad. Wapanucka Ls. Ostracods, gastropods (Bellerophon), sponge spicules, crinoid parts, corals (Stereocorypha, Pseudozaphrentoides, Amplexocarinia, Konickophyllum). Rowett, 1962, p. 251.
106	Small abandoned ls. quarry and roadcut where US 69 crosses ridge, NE¼ SW¼ NE¼ sec. 1, T 1 N, R 12 E, Atoka Co., Limestone Gap quad. Upper Wapanucka Ls. Corals, crinoid parts bryozoans, brachiopods, cephalopods, gastropods, sponge spicules. Rowett, 1962, p. 248.
107	Ls. quarry on property of Okla. sub-prison, about ½ mile NW of US 69, south line, NE¼ sec. 15, T 1 N, R 12 E, Atoka Co., Coalgate SE quad. Upper Wapanucka Ls. Koninckophyllum, Pseudozaphrentoides (corals). Rowett, 1962, p. 245.
108	Low ridge across SE¼ SE¼ sec. 3, T 1 S, R 8 E, Coal Co., Wapanucka N Quad. Wapanucka Ls. and Atoka Fm. Locality of Fusulinella prolifica Thompson Brachiopods. Rowett, 1962, p. 224.
*109	Cen. SW¼, NE¼ sec. 28, T 1 N, R 8 E, Coal Co., Tupelo quad. Atoka Fm., Barnett Hill Mbr. 4 species of crinoids, 2 new: Isoallagecrinus barnettensis (OU 7138) and Brabeocrinus primus (OU 7131). Strimple, 1975.

Locality	Description
*110	NE¼ SW¼ sec. 23, T 1 N, R 8 E, Coal Co., Tupelo quad. Atoka Fm., Barnett Hill Mbr. 6 species of crinoids, including 3 new species: <u>Atrapocrinus mutatus</u> (OU 6076), <u>Moundocrinus coalensis</u> (OU 6075 A), <u>Paracromyocrinus planatus</u> (OU 7129). Strimple, 1975.
*111	Cen. SW¼, NE¼ sec. 28, T 1 S, R 8 E, Coal Co., Wapanucka N quad. Atoka Fm., Barnett Hill Mbr. One new crinoid species, <u>Anchicrinus echinosacculus</u> (OU 7130). Strimple, 1975.
*112	Cen. N½ sec. 28, T 1 N, R 8 E, Coal Co., Tupelo quad. Atoka Fm., Barnett Hill Mbr. 10 species of crinoids, including 4 new species: <u>Proallosocrinus exemptus</u> (OU 7127), <u>Clathrocrinus grileyi</u> (OU 7132), <u>Affinocrinus orbis</u> (OU 7145), Strimple, 1975; and <u>Metacromyocrinus fundundus</u> (Strimple), Strimple, 1966.
113	Near cen. NW¼ sec. 10, T 1 S, R 8 E, Coal Co., Wapanucka N quad. Atoka Fm., Barnett Hill Mbr. One crinoid species described, <u>Metacromyocrinus fundundus</u> (Strimple). Strimple, 1966, 1975.
*114	Gully, cen. N line sec. 11, T 5 N, R 21 E, Latimer Co., Red Oak quad. Atoka Fm., 500 ft. below base of Hartshorne Ss. One thin bed of shale above what appears to be an algal reef. Invertebrate fauna diverse, apparently dwarfed. 33 species of Foraminifera, 6 of which are new. Galloway & Ryniker, 1930.
115	Naff's By-10. NE¼ NW¼ sec. 28, T 3 N, R 10 E, Coal Co., Tupelo NE quad. Middle part of Boggy Fm. Restricted assemblage of molluscs (8 sp.) suggests very shallow marine environment. Naff, 1962, p. 222.

Locality	Description
116	Naff's By-11. Near cen. W line, NW¼ sec. 8, T 3 N, R 10 E, Coal Co., Tupelo NE quad. Middle part of Boggy Fm. Limited fauna, 3 sp. of brachiopods and 1 gastropod sp., interpreted as deltaic. Naff, 1962, p. 223.
*117	Naff's By-21. Just E of U.S. Highway 75; near cen. N line, SW¼ sec. 16, T 3 N, R 10 E, Coal Co., Tupelo NE quad. Upper part of Boggy Fm. This mollusc-dominated fauna (interpreted as lagoonal) is unusual because of the concentration of conulariids. Naff, 1962, pp. 241-243.
118	Naff's By-22. NE¼ SW¼ sec. 16, T 3 N, R 10 E, Coal Co., Tupelo NE quad. Upper part of Boggy Fm. Bivalve-dominated fauna found in sandstone. Naff, 1962, pp. 244-245.
119	Naff's St-5. NW¼ NE¼ sec. 7, T 3 N, R 9 E, Coal Co., Lula quad. Lower part of Stuart Fm. 39 species, most brachiopods or molluscs, found in shale. Naff, 1962, pp. 259-263.
120	Naff's St-6. NW¼ NE¼ sec. 7, T 3 N, R 9 E, Coal Co., Lula quad. Lower part of Stuart Fm. Thin limestones contain abundant brachiopods, different from those found in shales (16 sp.). Naff, 1962, pp. 263-266.
121	Naff's St-7. Near cen. N line sec. 3, T 3 N, R 9 E, Coal Co., Tupelo NE quad. Upper part of Stuart Fm. Diverse fauna of invertebrates (38 species) dominated by molluscs, vertebrates are <u>Petalodus destructor</u> Newberry and Worthen and <u>Petrodus occidentalis</u> Newberry and Worthen. Naff, 1962, pp. 266-270.
122	Rigby's Loc. 1. N side of Okla. State Highway 63-1, 1.5 mi. E of Hartshorne, SW¼, NE¼ sec. 9, T 4 N, R 17 E, Latimer Co., Hartshorne quad. Middle Atoka Fm. (deep-water shaly facies). One specimen of the sponge <u>Dictyospongia sp</u>., Rigby et al., 1970, pp. 824-826, Pl. 116, fig. 1.

Locality	Description
*123	Rigby's Loc. 2. Abandoned Youngman Bros. Quarry, 1.7 mi. E of Hartshorne, on S side of Limestone Ridge, S of Okla State Highway 63-1, S½, SE¼ sec. 9, T 4 N, R 17 E, Latimer Co., Hartshorne quad. Upper Wapanucka Ls. This is an important fossil sponge locality. Rigby describes the new species Haplistion apletum (pp. 821-824, Pl. 115, 2, 4; Pl. 116, 3; Text-figs. 6-10) and Arakespongia mega (pp. 828-830, Pl. 117, 1-6; Text-figs. 11-12) and redescribes Phacellopegma schizoderma Finks (pp. 817-821, Pl. 115, 1, 3; Pl. 116, 4; Text-figs. 4, 5). These are some of the largest Paleozoic sponges known. Rigby et al., 1970.
124	Rigby's Loc. 3. On ridge in extreme S part of sec. 23, T 3 N, R 14 E, Pittsburg Co., Pittsburg quad. Upper Wapanucka Ls. Well-bedded hexactinellid spiculites (sponge-spicule-rich layers). Rigby et al., 1970, p. 831.
125	Rigby's Loc. 4. On NE side of U.S. Highway 271 and Okla. State Highway 2, NE¼, SW¼, SW¼ sec. 22, T 1 N, R 19 E, Pushmataha Co., Clayton quad. Upper Johns Valley Sh. (deep-water sandy facies). Sponge-spicule-rich layers. Rigby et al., 1970, p. 831.
126	Rigby's Loc. 5. NE side of U.S. Highway 259, SW¼, SE¼ sec. 23, T 3 N, R 25 E, Le Flore Co., Page quadrangle. Uppermost Johns Valley Fm. or lowermost Atoka Fm. Sponge-spicule-rich layers. Rigby et al., 1970, p. 831.
127	Rigby's Loc. 6. SE side of U.S. Highway 259--Okla. State Highway 103, 3.3 mi. S of crest of Kiamichi Mtn. NE¼ sec. 5, T 1 N, R 25 E, Le Flore Co., Page quad. Wesley Sh. Sponge spiculites. Rigby et al., 1970, p. 831.

Locality	Description
128	Rigby's Loc. 7. S of Limestone Gap, where U.S. Highway 69 cuts Limestone Ridge, on E side of road, NE¼ sec. 1, T 1 N, R 12 E, Atoka Co., Limestone Gap. Upper Wapanucka Ls. Well-bedded hexactinellid spiculites (sponge-spicule-rich layers). Rigby et al., 1970, p. 831.
*129	U.S.G.S. lot 8014. Devils Hollow. SE¼ sec. 32, T 4 N, R 21 E, Latimer Co., Red Oak quad. Lower part of Jackfork sandstone. An important assemblage of plant megafossils, including 8 new species: *Calamites miseri*, *C. inopinatus*, *Lepidodendron subclypeatum*, *Lepidostrobus peniculus*, *Rhabdocarpos* (*Lagenostoma?*) *costatulus*, *Rhynchogonium choctavense*, *Trigonocarpum gillami*, and *T. vallisjohanni* White, 1936. Coll. by Miser, Cooper, and Fitts, 1929 and Miser & Miller, 1927.
130	U.S.G.S. lot 8340. SE¼ sec. 33, T 4 N, R 21 E, Latimer Co., Red Oak quad. Lower part of Jackfork Ss. Plant fossils, including 3 new species: *Rhabdocarpos* (*Lagenostoma?*) *costatulus*, *Calamites inopinatus*, and *Rhynchogonium choctavense* White, 1936. Coll. by H. D. Miser, 1927.
131	U.S.G.S. lot 8339. SW¼ sec. 10, T 4 N, R 25 E, Le Flore Co., Heavener quad. Jackfork Ss. or Atoka Fm. *Calamites miseri* White, n. sp.; White, 1936. Coll. by J. A. Taff, 1899.
132	Sec. 6, T 1 S, R 13 E, Atoka Co., Limestone Gap quad. Johns Valley Sh., probably from the shale itself rather than from one of the boulders it contains (Read, 1938). One specimen of a fern stem, *Ankyropteris hendricksi* Read, new species. Coll. by T. A. Hendricks, 1937. Read, 1938.

APPENDIX B: MAPS

The following U.S.G.S. Quadrangle maps accompany the original of this report.*

Quadrangle	County	Map No.
Adamson	Pittsburg	1
Boggy Depot	Atoka	2
Clayton	Pushmataha	3
Coalgate	Coal	4
Coalgate SE	Coal, Atoka	5
Crowder	Pittsburg	6
Enterprise	Haskell, Pittsburg	7
Featherston	Pittsburg, Latimer	8
Hanna	Pittsburg	9
Hartshorne	Pittsburg, Latimer	10
Hartshorne SW	Pittsburg	11
Haywood	Pittsburg	12
Heavener	Le Flore	13
Higgins	Latimer	14
Kiowa	Pittsburg, Atoka	15
Krebs	Pittsburg	16
Lehigh	Atoka, Coal	17
Limestone Gap	Atoka	18
McAlester	Pittsburg	19
McAlester SW	Pittsburg	20

*On copies of the report see Figure 1 for locality numbers.

Quadrangle	County	Map No.
Pittsburg	Pittsburg	21
Potato Peaks	Le Flore	22
Quinton S	Haskell	23
Red Oak	Latimer, Le Flore	24
Savanna	Pittsburg	25
Scipio	Pittsburg	26
Stigler W	Haskell	27
Tupelo	Coal	28
Tupelo NE	Coal	29
Wapanucka N	Coal, Atoka	30
Wardville	Atoka, Pittsburg, Coal	31

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